

A N

# ACCOUNT

OF A £.1409

*Portable Barometer,*

WITH

• Reasons and Rules

For the Use of it.

How to Weigh the Air, Measure its

Height, and foretell all the alteration of Weather; the Constitution of the Atmosphere, and how the Effluvia keep off the Air's Gravitation: with a New Account and Experiments, how Rain, Snow, Winds, Frost, Thunder, Lightning, Hurricans and Tornadoes are produced: And an inquiry, whether the Planetary Beams or Influence can cause an alteration of weather, to be foretold by them:

With a sensible Demonstration of their Influences, and the insufficiency of all Hygrometers, Thermometers, and other Inventions, to discover the alteration of Weather by.

And lastly, Rules and Experiments for the certain knowledge of all the alterations of Weather, both in Quantity and Quality.

---

By GUST. PARKER, Med.

---

L O N D O N,

Printed for William Flax at the *Sign* in Ludgate-street,  
MDCCLX







---

---

THE  
Preface

**T**HE business of  
a Portable Ba-  
rometer have  
been the endeavours of  
several Men above Thir-  
ty Years last past: To  
find out some way or o-  
ther to put the Quick-  
A 2 silver



## The Preface.

*silver Glass into a secure Travelling Posture: at last they got a way to tye a piece of Leather over the Cistern and round the Tube, and such they called their Portable Barometers, which the Philosophical Transactions saies, are no ways to be trusted to, by reason of their Intolerable Errors, and besides are indeed no ways Portable: which this of mine is to every body that can but walk, and*



## The Preface.

and will whether they  
will or not shew any  
alteration of Weather,  
and several other things  
besides: But this short  
Account being altogether  
new, and I believe the  
first that ever came a-  
broad of this nature,  
consisting only of Expe-  
riments and Discoveries  
of this Instrument, it  
will I hope (from  
friends especially) want  
the less Apology, both for  
the Stile, Matter, and  
manner which is not of-  
ten



## The Preface.

ten so smoth well digest-  
ed and ordered in a thing  
that never was before, as  
it may be a second time :

And I hope the conside-  
rations of the usefulness  
of these Barometers in  
all the following and many  
other Discoveries will  
excuse the rest, not only  
in what concerns the  
true Nature, Quality,  
Temper and Inclinati-  
ons of the Air, as to its  
self and the alterations  
of the Weather, but all  
other Liquids as well  
which



## The Preface.

which may thus be divers ways both weighed and measured at the same time in their Fountains, and thereby discover many particular qualifications very hard and difficult if not impossible by any other means, and thereby also in time give a Demonstration of the true System of all Natural Bodies.

And being thus led to the knowledge of their Consistence will be

con-



## The Preface.

conducted from thence to  
their *Prima Materia*,  
and so to the Grand Sy-  
stem of the Great World.

But as there are some  
who have gained the way  
of making others little upon  
Trust, so they will ab-  
hor the news of any that  
undertake to undeceive  
them, and will neither  
give themselves, nor o-  
thers leave to consider  
what another have done:  
Yet if they will set to  
work and Merit their  
own

## The Preface.

*own Encomiums with  
Meum and Tuum, they  
shall have every thing  
due to their Characters  
from.*

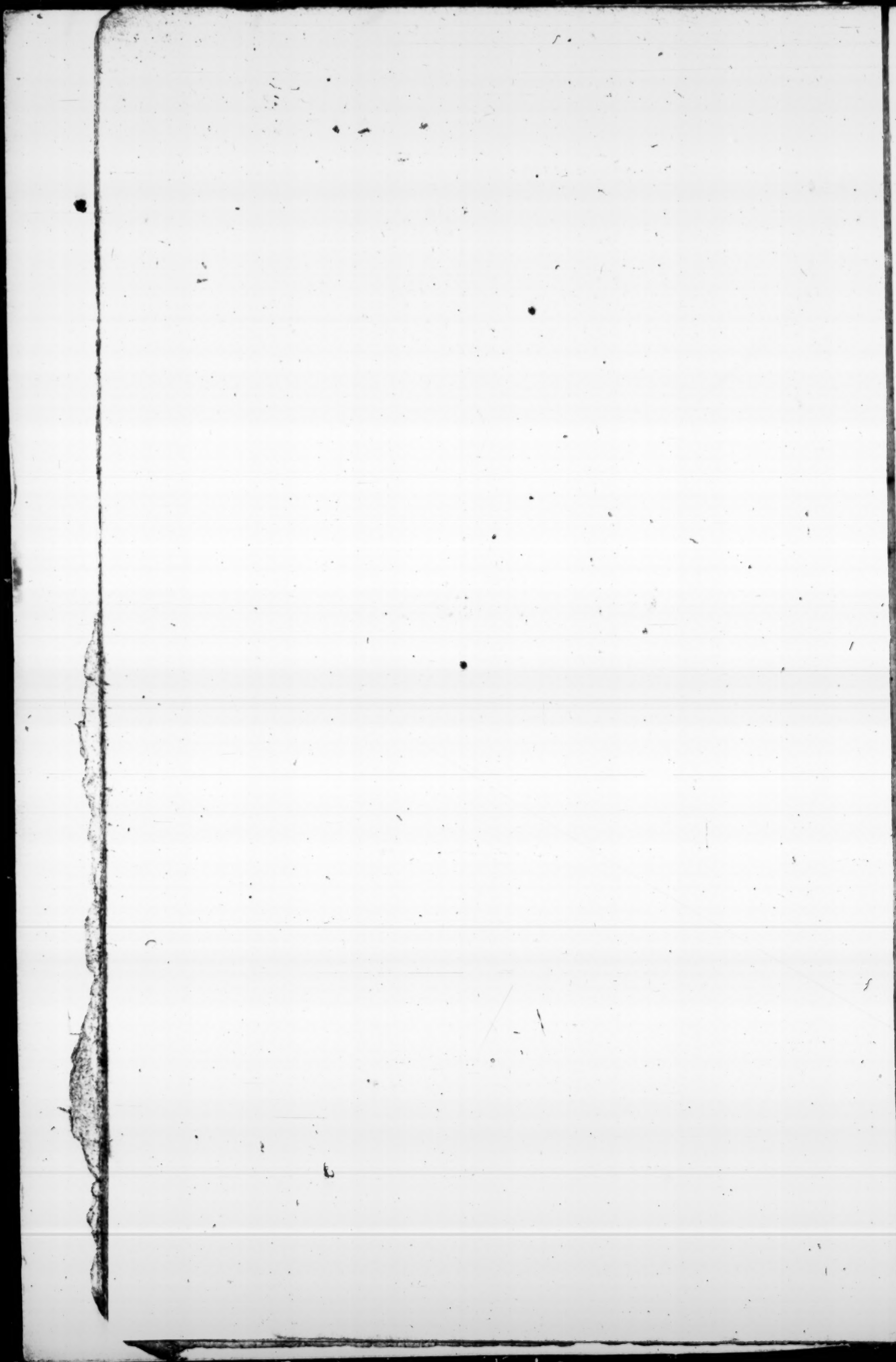
Gul<sup>ts.</sup> Parker.

---

B

A N





AN  
ACCOUNT  
OF A  
Portable Barometer.

---

CHAP. I.

*First what the Portable Barometer is, the Constitution of the Atmosphere, and how the Effluvia keep off the Airs Gravitation, and are the cause of the variation of its weight.*

**W**Hat I have to offer about a Portable Barometer I once intended to shew the world in another manner, but since  
B 2 that





---

A N  
A C C O U N T  
O F A  
Portable Barometer.

---

C H A P. I.

*First what the Portable Barometer is, the Constitution of the Atmosphere, and how the Effluvia keep off the Airs Gravitation, and are the cause of the variation of its weight.*

**W**Hat I have to offer about a Portable Barometer I once intended to shew the world in another manner, but since  
B 2 that



that could not be I am unwilling by reason of the extraordinary service it may be applied to in Philosophy, Hydrostaticks and Mechanicks, they should know nothing of it, yet know no reason after a great deal of Labour and Charge to give it away, but could rather wish there were something ordered for a present reward, according to the worth of every discovery, whereby every improvement would immediately receive a thousand improvements if it were capable, and the World the benefit at the same time: And for the Philosophical Reasons of the Natures of these things from Authors I never saw any, either of Meteors or this, and as I suppose the thing is New, so I know nothing but what reason has taught me in the use of it, for about two years and a half. Therefore it cannot be supposed the Method, Reasons or Rules should be so smooth, Direct and Perfect the first time as they may be afterward, if I live  
and

and do well to make another Edition.

The Portable Barometer is an Instrument that weighs the Air, measures its Height, and foretells all the alterations of Weather both in Quantity and Quality, which for the better understanding it will be convenient to tell the reasons, which I shall do in ten Particulars, Then shew the manner in its use, and settle the Rules, for there is no alteration of Weather, which is not preceeded by an alteration of the weight of the Air, both for Heat and Cold, as well as Wet and Dry, which comes to pass in this manner.

The continual motion of the Parts of Matter, of which all things are composed, and from whence they encrease and decay, begets a mighty Emancipation of Atoms, with constant Emanations from every part of all sorts of Bodies, which being pressed on every side  
by



by the Universal Fluid of Air gives them particular bounds, and so constitute an Atmosphere or Sphere of Atoms to every Body ( and is thereby also the cause of Electrical Attractions ) therefore the great Globe of Earth and Water, with all its consistent Bodies must needs have very Copious Effluvi-ums, and so make a very large Atmosphere, being by an Universal Motion driven from every part of the whole, as far as the Power of that Motion, and the Pressure of the Air will give leave, which by that Pressure and their own weight are again returned like random-shot, from whence they are sent : This Sphere of Atoms ( or at least our Hemispherical part thereof ) is sometimes filled with more and less Emanations by the inequality of that Motion several Undulations, particular Eddies, and the Effluvia Circulations, which in like manner does more or less keep off the Airs Gravitation whereby a Cylinder of the Air cannot

cannot weigh so much in wet or Winds Weather as it does in dry Weather ( and not as *John Smith* tells us by his Principle of Philosophy, that the Air is lighter by being mixt with watery vapors, tho a thousand times heavier than its self, and mixes Water with Rectified Spirits of Wine for a Demonstration in his *Horological Disquisitions* pag. 75. ) I say Winds as well as Wet keep off the Airs Gravitations for Winds also being only humid bodies sufficiently dilated and by that Expansive force the struggling Atoms as strangely agitated, with numerous and powerful Attacks from multitudes of fresh Emancipations and Eruptions from our *Æolian Globe* must needs keep off the Air's Gravitation, much more then other Pacide Vapors ( as I shall further Demonstrate in the third and fifth Chapters following ) which in the Common Barometer make very considerable alterations, tho there be no Rain, and



( 6 )

and are easily discovered by several Hygroscopes by their surprising Gravities, as I shall shew in the tenth Chapter. Thus our Æolian Effluvia do not only keep off the Gravitation of the Air, but are the cause of the variation of its weight.

---

CHAP.

## C H A P. II.

*How Rain and Snow are Generated and Produced, and why they make a Cylinder of Air lighter, and yet any other particular parcel of Air much heavier.*

W HAT I have to say upon the Contents of this Chapter, is not of the prime cause of Rain and Snow, but only a short account of their Generation and Production, in relation to their affections of the Atmosphere, for the better understanding of the nature and use, of the Barometer. Rain and Snow, then are generated of the same matter : But for distinction I will first give an account of Rain, and then of Snow. Rain is generated of the Effluviiums that constitute our Ter-  
aqueous Atmosphere, being by their Emancipated motion in a certain  
C part



part thereof driven towards the extremity of the Sun's reflections into a cooler Region, they soon condense in some little part first, which Condensation immediately makes room for the natural Elasticity of the Air, which as soon begins to carry along with it all the other Effluvia round about to the first Condensation, where being by this Elastick force, first brought from all the neighbouring parts, the Effluvious Air then runs down by its own weight and Elasticity from every side to a vast extent, where being heaped and crowded together, they not only fall by their Innate Gravity, but by the same motion of Air (which now is Wind) are sent down sometimes with extrem violence, and thus not only the neighbouring Atoms are condensed in a little Cloud and small Showers, but the whole Hemispherical Effluvia are driven and drawn together and discharged upon a whole Country or national Horizon oftentimes, till the whole half Atmosphere is emptied of all those

Va-

Vapors, and then having made a Current from every part beyond, all the other Emanations that are raised in other parts of the world as readily flow hither, to be discharged here in continual Rains for a long time together; till by a particular Condensation in some other Place, the course is altered and the Current turned, and then it may be Dry as long; the Continual stream of Atoms being carried away to other Places to be discharged there.

The difference between storms or a little wet, and lasting settled Rains, is that in the first Emancipated Atoms being not so thick or Copious as at other times in their elevating Motions, become Bounded by Particular Eddies of Air, which drives them so close together, that by this means they are formed into Clouds; and by their being driven yet closer together, by the Power and strength of these Eddies, and the Addition of fresh Matter: The small Atoms fall so fast one into another by



Cold and Compressure that very large Drops are Immediately produced and sent Down with more or less violence according to the Disposition of their Motion, the Season, and Air.

But in settled Rains, the Effluvious Vapors, having for some time before been continually filling our Hemisphere, from all parts without any discharge, in a still and quiet manner without disturbing the Air; at last receive a Condensation as above in some particular part, which Immediately makes way for the Airs Elasticity.

But being now every where filled, which these Vapors cannot unbend or move so fast; yet continually brings the Neighbouring Vapors, and so are gently and continually sent down as long as they last.

Snow is generated of the same Effluvium's or small peices of moisture when the Sun is at a convenient Distance, and the Country proper with Hills, Mountains, and Latitudes. The Calorifick Beams being

being easily hindered by them, or not tended far enough for the other, together with the Assistance of the Contrary Motions, or Interpositions of the Beams of the other Stars; or obstructed by the Numerous Effluvia that murales or or walls the whole Atmosphere, or by contrary currants of Air, or Winds: and the Heat being thus or any other ways kept off, and the Effluvious Vapours continuing their Pneumatick Motions, without any great pressure, they are not condensed into Drops, but are frozen in their own shapes, in some little part first: which is quickly extended to all the rest by the Frigorifick Saline, Particles as they use to tell us, universally dispersed and mixed with these Atoms. But rather by the former privations, as will be further demonstrated in the 6 Chapter. Then being driven a little closer they fall by their own weight in bigger or lesser Flakes, and with more or less driving according as the Motion, Cold and Pressure is. Then



as for Hail, that is seldom any other ways than in Storms, and is a kind of half frozen Snow and Rain mixed together. The manner of its generation and Production may be easily conceived by the account I have given of Rain and Snow with better satisfaction than what they use to tell us of the drops freezing after they fall from the Clouds, which is almost impossible. But this being not so directly to my purpose, I shall say no more of it, but only demonstrate how Rain and Snow which thus thickens and fills the Air, yet make a Cylinder thereof much lighter, but any other particular parcel of Air much heavier. The reason why Snow and Rain make a Cylinder of Air lighter, is that the Effluvious vapours that constitute the Atmosphere and of which it consists, being so very numerous from every part of Matter, and so constantly and powerfully sent out, that they not only make particular streams from the more fluid parts, but an universal stream from the whole  
Globe

Globe of Earth and Water, and all other consistent Bodies whatever. This universal stream or flood of Vapors being thus united in all parts of the world, make an intire screen of condensed or thickened Matter to a great thickness, being near a thousand times more solid than Air, before they appear in Clouds, and therefore must needs keep off or stop the Airs penetration, and thereby its Gravitation, which yet does not require a general Rain or Snow, for a little that comes by particular Currents or Eddies in Storms will do it, for they being of no great height, want no great extent, to hinder both the direct and collateral pressure of the Air, as has been observed by common Barometers in a little distance. Thus the Ethereal Particles are always hindred by these Emanation, at all times, but much more in wet than in dry weather, and the nearer the Earth's Surface, the more they are obstructed, as appears in the little heights of small Hills, by the same Barometers, so that



that it is impossible a Cylinder of Air should weigh so much in wet, as it does in dry weather, which I shall now demonstrate by Experiments also.

*Experiments in weighing the Air.*

In weighing the Air with the Portable Barometer the Weights may and do consist of Ounces, Drachms, Scruples and Grains, and may as well be Pounds, or Hundreds, but will be most Convenient to have them of one Denomination, and the bigger or more Weights we use, the greater will be the variation of the smaller parts (if the Balance be good) to foretell the last as well as other alterations of weather by, which with small weights except the Balance be very nice, will not be easie to distinguish so many minute variations as all the alterations of weather will require; I have therefore a weight consisting of, or divided into 2000 equal parts for the Middle or Center of variation, and have

have not yet observed the weight of Air to vary full 60 such parts, either above or below that number, that is 120 in all, so if the weight be bigger the variations will be more, as this of 2000 is 120, if it were 4000, the variation would be 240 such parts, which is near ten times as much as in the Common Barometer, but if it be but 1000, the variations will not be above 60 such parts, which is 3 times as much as the common ones, and to be less will not be so serviable.

*January 3.* 169<sup>a</sup> a Cylinder of Air weighed but 1951, having been very wet the day before, and rained all the night preceeding, and now extream dark thick weather, but no rain this thrid day.

*Jan. 4.* it weighed 1958, being very Cloudy, but no Rain this day neither.

*Jan. 6.* it weighed 1964, when it rained all the day abundance.

The first of these times the Common Barometer was something below much Rain, the next the Quicksilver stood at much Rain, and in the last one division above much Rain.

D

Sept.



that it is impossible a Cylinder of Air should weigh so much in wet, as it does in dry weather, which I shall now demonstrate by Experiments also.

*Experiments in weighing the Air.*

In weighing the Air with the Portable Barometer the Weights may and do consist of Ounces, Drachms, Scruples and Grains, and may as well be Pounds, or Hundreds, but will be most Convenient to have them of one Denomination, and the bigger or more Weights we use, the greater will be the variation of the smaller parts (if the Balance be good) to foretell the last as well as other alterations of weather by, which with small weights except the Balance be very nice, will not be easie to distinguish so many minute variations as all the alterations of weather will require; I have therefore a weight consisting of, or divided into 2000 equal parts for the Middle or Center of variation, and have

have not yet observed the weight of Air to vary full 60 such parts, either above or below that number, that is 120 in all, so if the weight be bigger the variations will be more, as this of 2000 is 120, if it were 4000, the variation would be 240 such parts, which is near ten times as much as in the Common Barometer, but if it be but 1000, the variations will not be above 60 such parts, which is 3 times as much as the common ones, and to be less will not be so serviable.

*January 3.* 169<sup>a</sup>, a Cylinder of Air weighed but 1951, having been very wet the day before, and rained all the night preceeding, and now extream dark thick weather, but no rain this thrid day.

*Jan. 4.* it weighed 1958, being very Cloudy, but no Rain this day neither.

*Jan. 6.* it weighed 1964, when it rained all the day abundance.

The first of these times the Common Barometer was something below much Rain, the next the Quicksilver stood at much Rain, and in the last one division above much Rain.

D

Sept.



*Sept. 12. 1698*, a Cylinder of Air weighed 2025, it was very fair, clear and dry.

*Octob. 3. 1698*, a Cylinder weighed 2022, being very fair clear and dry.

*Decemb. the 3d. and 4th. 1698*, a Cylinder of Air weighed 2026, being very fair, yet thawing and a hard frost going away.

In the first of these, the Common Barometer was at fair, and at the second very near, at the last somewhat above fair.

These I believe are sufficient to prove that a Cylinder of Air does not weigh so much in wet as in dry weather, but yet a particular parcel of Air as a Quart, Gallon or Bushel, &c. must needs weigh much heavier in a wet time or tho' only misty, then in a clear Season, it containing so many watery Particles every where within our reach, that there is not above one third part of pure Air, if so much as I have several times tried.

*Octob. 21 and 22. 1698*, it rained both days almost from morning to night, and so much in *Buckingham* and *Bedfordshire*, that the like had not been known.



known. On the 21, I took a Bräfs *Æolipile*, which held something more than a Pint and half, a little better than eight and twenty ounces of common well Water, this was made as hot as it would indure, and then the Orifice was very well stoped with a firm Cement, and so laid to cool, and when it was through cold, in an exact pair of Scales, it weighed Eight Ounces Seven Drachms and a half, the Orifice being then opened to let in the Air, it weighed something above 19 Grains more: a Cylinder of Air at the same time weighed 1962, and the Quicksilver Glass stood 4 below Changeable. The 22 in the morning the same quantity of Air weighed near 20 Grains, a Cylinder of Air 1963, and the weather-glass as before.

Jan. 2. 169<sup>8</sup>, being a very wet day, when a Cylinder of Air weighed but 1949, the Weather-glass at 2 below much Rain, the emptied *Æolipile* contained 21 grains and a half of humid Air.

Jan. the 6. following very wet again, yet a Cylinder of Air weighed 1964, the Weather-glass three divisions higher than on the second day, but the



exhausted Æolipile 22 Grains of humid Air this day.

Then on the 12th of *Sept.* 1698, when a Cylinder of Air weighed 2025, the Weather Fair, the Æolipile heat and weighed as before, would now hold but 15 Grains and a half of Air.

*Octob.* 3d following a Cylinder of Air weighed 2022, being very fair and clear, the Weather-glass very near the same height, the Æolipile weighed 16 Grains more when the Air was let in then before.

*Decemb.* the 4th 1698, a Cylinder of Air weighed 2026, being very fair but a little misty, the Weather-glass a little above Fair, the exhausted Æolipile near 17 Grains more when the Air was let in, then it did before. This I believe is sufficient to make good the Title of this Chapter, and prove the truth of a Paradox or two, that the Air is both lighter and heavier in wet weather, and both heavier and lighter in dry weather: But there is, nor can be no certainty in the Æolipilan way as I shall demonstrate in the 10 Chapter, to foretell any alteration of weather by.

## C H A P. III.

*How Winds, Storms, Tempests, Hurricanes and Tornados are produced?*

**T**He Portable Barometer, being an Instrument that discovers all the alterations of Weather, it will be convenient to give some account of Winds also, what they are, and how produced, for they are as well foreseen by this as any other sort of weather, and the reason we have had no better knowledge of them, is only for want of a true method in Science, to direct us in all natural observations to enlarge and confirm our knowledge, That have kept us from it, therefore what I have to say of Winds cannot be expected to be either so full or perfect as what is delivered of more obvious Subjects, being not so Cognisable to our Senses, but are indeed of a Metaphysical Nature, of which few I  
sup-



suppose have made any great experiments, but only given us some Historical relations of their strangeness, and tho Winds are only the motions of Air, yet their origines are almost as various as their motions, and cannot be had from any one cause, but we must ascend into the Regions of the Air, and descend into the Caverns of the Earth, and Waters of the Sea, to understand them, for we can never confine their original to any one efficient, nor ( I believe ) there never was any single Theory yet stated, that would resolve the whole Phænominon of Winds, which may be generated these six ways, by Rarefaction, Compression, Elasticity and Resilition, or by Subterranean, or Submarine Eruptions. The universal Efficient of the first four is chiefly the operations of the Sun Beams upon the Effluvious Air, and that of the other two from Subterranean Vutrano's and Calid Emotions of Mineral Heterogenities, as I shall successively shew.

*First*, by Rarification, that Air may be dilated to 100, 200, nay 13000 times its former extent, as the Honourable

nourable Esquire Boyle, *Merfennus* and others have experienced without heat, by removing the Circumjacent Pressure of the other Aerial Particles, but let this or any such Rarefaction be produced from what cause soever, either by the Sun Beams, or any other heat, or Condensation of some particular part, to make room for the natural Expansion of another, the effects will be all one, a Wind must insue by the Protrusion of other Air, which by this means crowd and Superonerate the former spaces, whereby that wonderful and admirable Emotions of the Atmosphere is produced, we call Wind, which is more or less violent according to the force and extent of the Rarefaction.

*Secondly*, Compressure is another way, by which Winds may be generated, the Effluvious Air being in continual motion, not in one, but several Currents must needs produce very numerous undulations, these together, almost as many Eddies, whether in pure Air, Effluvious Vapours, or Clouds, which in contrary Currents meet, with more or less violence, according



according to the Bigness, Strength, and Density of the Matter, by which means the Wind may (as the pressure is) violently descend Perpendicularly to the Earth, or being reverted by cross or collateral obstructions, heaping and pressing Superonerations, makes as violent Whirl-winds, Hurricanes or Tornadoes, &c. to blow from all the parts of the Compass at the same time, with amazing Displosions, as if the Heavens and the Earth were going to be torn in pieces, by these examining Tempests. But their several Species is not my present business, only the use of the Barometer, but if Life and Leisure serve, it may be done in another Edition.

*Thirdly*, Elasticity the natural springiness of the Air is another cause of Winds, for tho we suppose our Atmosphere to be in never so still and quiet a posture, and all things most calm and sedate, yet 'tis impossible it should be all of one universal consistency, but must contain a great variety of rare and dense parts, from the Local Differences the Emanations proceed from, either Waters or Marshes,



or dry Lands, and these different degrees of fluid Densities, being upon a just and true Equilibrium, a small strenght of other Elastick Particles between, turns them any way, which immediately make room for a numerous succession of other Auxiliaries to a vast extent, that carries all before them in an impetuous Wind. So that whenever any Aereal Particle has leave to unbend it self in any posture, it immediately gives way to the other neighbouring Particles Expansions, and as the motion is made, to others beyond, to a mighty extent, by which means their strength is also encreased to a mighty proportion, with the addition of their weight, to their Elasticity, and so carries all before them to the turning up of the strongest Oakes or Buildings, which continue till the Elastick Particles are driven to their utmost extentions, that the other pacid Particles will yeild to, and then they begin again to curl and fluctuate, and by degrees to settle in their native postures, and a quiet calm, till fresh causes give them new disturbances.

E

Fourthly,



*Fourthly*, The Resilition of the Atmosphere is another cause that produces wind, the Effluous Air being easily taken and brought into currents by several Meanders, as well in the upper as in the lower Regions; in the upper by the Sun Beams, or the particular constitution, or local position of the same Effluviuums; and in the lower by the Waters in several Seas and Channels, and also with several Mountains and Valleys by Land, this tender fluid being so very tractable, so easily susceptible and long retentive of the last Impression, that 'tis a kind of a perpetual Automata, which may by these or several other ways be brought into Currents; but yet it is almost impossible these Currents should be continued in even and uninterrupted Orbicular courses, but must be met or obstructed by several Clouds and Denfities in the Atmosphere, Hills, Mountains, the Sun Beams, contrary Currents of Air, Provincial Trade or Etesian-winds, Mascarets, &c. any of which obstructions forthwith begets this Resilition, and that more or less wind, according to the bigness and



and strength of the recoyling Protru-  
sions.

*Fifthly*, Subterranean eruptions are another cause of Winds, which eruptions are produced by the Calid Emotions and Effervescencies of Mineral Heterogeneities that plentifully abound in all parts of the world; and these Calid Emotions by the mixtures of the Effluvious Acids from Niter, and other Salts, Vitriols, Sulphurs, Antimony, &c. which will immediately heat only with a small quantity of fair water (as Spirits of Niter and Vitriol, &c. which are only their acid salts freed from their more Terrestrial parts, and united with a little Phlegm, mingled with water will do) the small Particles of which are always at hand, and can never be wanting in no such places. And with bigger additions of other Auxiliaries, are in some places augmented to actual fires, by which means their acid Salts are made Alcaline, and so furnish the whole Universe with sufficient matter for Effervescencies, and fermenting Calid Emotions by the continual actions and reactions of their Acid and Alcaline Particles,



as quick Lime and Water, or these with Sal Armoniack, &c. or any Acid Spirit with the ashes of Wood, Bones, Coals, or other Alcalies will immediately heat and boyl without fire, with such strength and violence, that the strongest Vessel cannot contain them. Thus the Subterranean Caverns are the Kingdom of *Aeolus*, and Nature's Chymical Furnaces, where all the numerous Cranies are Receptacles of Wind, from the internal Vulcano's, Rarefactions, which are continually sent Night and Day from all those places, and constantly disturb our Atmosphere more or less, in one place or another, by their powerful Propulsions: For the Earth is the first Mother of Meteors, and contains all those restless Spirits and Effervescencies, that afterwards raise Storms, Tempests, Hurricanes, and Tornado's by Sea; several raging Winds and violent Storms by Land, Thunders and Lightnings in the Air, and Earth-quakes under ground, frequently known to come from the burning Mountains in *China*, the Grotto's in *Calabria* and *Sicily*: The *Alps* and many other places of the World.

Sixthly,



Sixthly, Submarine eruptions are produced in the same manner under the Sea, as the others are under the Ground, and generate Winds as they do, and are called *Procella Cæca*, they break out in a Cloud or Mist, from under the Water, and encrease and diffuse themselves, till they cover the face of the whole Heavens, and end in most dreadful Tempests, we have an account of one from our Fleet at *Duncannon*, by the Principal Officers to their Superiours in *England*, related by *Esquire Boyle*, that in a calm day, there suddenly ascended a black Cloud out of the Water, hard by them, in shape and bigness of a Barrel, which afterwards ended in so hideous and dreadful a Tempest, that it forced the Ships to Sea again, in the greatest danger of total destruction, and had like to have cast them away. So in *St. Owen's Bay*, in the *Isle of Jersey*, when never so calm, and no Wind stirring, these submarine Tempests often appear, and the roaring of the Waves are heard all over the *Isle*, and 20 or 30 miles into *France*, and in the River *Dordogne* near *Bordeaux*; the Mascarets swell the



the Water into Mountains, and the People cry out *Garde le Mascaret* in Summer time, and the calmest air. So the Gulf of *Lions* often threatens the adjacent Country with a Deluge, the Lake of *Geneva* and several other places from the same causes.

---

#### C H A P. IV.

*That violent Tempests, Hurricanes, or Tornadoes, &c. seldom happen in cold Countries, Winter-seasons, Large Plains or great Seas.*

**W**inds being generated according to the preceding manners, they may consist of almost infinite variety of Salts, Sulphurs, Spirits, Mineral and Subterraneous Juices, Damps, and Æolian Ejections, Mists and rarified Vapours, Rain, or dissolved Snow, broken and dissipated Clouds, or agitated Air, and so may be hot, cold, dry, moist, &c. and thereby also more or less lasting or violent according to the

the matter, power and plenty of their Causes, yet must be raised in natural ways from their Fountains or proper Productions, which are very easily effected (without recourse to Occult Causes) upon so tender a fluid as Air, by the foregoing ways in the preceding Chapter, and may be as truly foretold by the Portable Barometer notwithstanding all this variety, by the alterations they produce in the weight of the Air, but yet violent Winds, Storms, Tempests, Hurricanes, Tornadoes, &c. cannot be so easily produced in cold Countries, hard frosty seasons, large Plains or great Seas, as in warmer Regions, Rocky Countries, or narrow and craggy Seas, for in cold Countries, or frosty Seasons the Efflu-  
 vious Air is too much Condensed into a kind of fixation, and thereby not only keep the Effluvia in the same posture, but walls the very Atmosphere against all other Pneumatick Attacks whatever, that the most violent Protrusions of Exotick force can never disorder their Perennial Structure, but can only displace some outward Particles, which the standing force of the  
 rest



rest will take no notice of, nor can there be any internal disturbance to disorder their quiet, for the same cold that fixes the Effluvia keeps them so, and hinders all other commotions, and also shuts the pores of the Earth, hinders the Rarefaction of Vapours, and stops all manner of Effervescencies, and calid Emotions of Subterraneous Mineral Heterogeneous Spirits and Ejections, whereby the Atmosphere must needs be much more quiet and free from these raging disturbances in such places and at such times, than in hot mountainous or rocky places.

And so in large Plains or great Seas there can be nothing to interrupt or obstruct the currents or course of the Air, but as it comes, so it continues its progress, and goes away in a great body to a vast distance, and meets with neither resilitions nor compressions, no Hills, Mountains nor Vulcanos, but is continued almost in a perennial Course, either with the Sun, Earth or *primum mobile* in all such places as well as the whole Torrid Zone, and some degrees on each side (except in Rocky Countries, narrow Seas, &c.) In Trade, Etesian



Etesian or Anniverfary Winds, or with  
 the Courfe of the Sea, or Air and  
 Water, as the Levant and Provincial  
 Winds in continued Streams, or at  
 moft in gentle puffs, and even Gales  
 created by the motion of particular  
 Clouds, foft Rains, moderate Storms,  
 or Effluvious Denfities that propell  
 the Air before them in fuch undulous  
 Afperities, but muft be fomething ex-  
 traordinary, or a great Complication of  
 caufes that can feldom happen to pro-  
 duce a Hurricane, Tornado, &c. be-  
 fides in cold Countries great Seas, large  
 Plains, &c. the chief material efficient  
 are wanting, a powerful Effervefcency,  
 confufed Eddies, Tranfverfe Refiliti-  
 ons, ftrong Compreffions and heaping  
 Superonerations, therefore befides the  
 freedom from thefe violent forts of  
 weather, thefe places muft needs enjoy  
 more mild and temperate feafons at all  
 times (except heat in the Torrid Zone)  
 than any other, yet heat and cold as  
 well as all other forts of weather, are  
 caufed by the particular temperature,  
 difpofition of the Atmosphere, affifted  
 by the prefence or abfence of the Ca-  
 lorifick Beams, and conftitution of the  
 F place,



place, and so may be as well foretold by the alterations they make in the weight of the Air as any other sort of weather, as I shall shew in the Seventh and Eighth Chapters following.

---

### C H A P. V.

*That they are easily foretold, because they produce the greatest variation in the weight of the Air.*

**W**Inds being only the motions or agitations of our Effluvious Air, it may at first seem strange how they should cause so great an alteration in the weight thereof above any other sort of Weather, and will be almost surprizing to see a Cylinder of Air that now weighs 2020, or more, in a few hours, not to weigh above 1970 or less, and after the Wind is over, in a little longer time, to weigh 2020 again, or more than it did before, till the matter and causes are considered. If our Hemispherical part of the Atmosphere continue of an even thickness

and



and the Effluvia in the same posture, a Cylinder of Air must needs continue of the same weight; for as there is nothing to alter its density, so 'tis impossible it should alter its gravity, and continuing of the same weight, the Effluvia are neither dispersed, nor more heaped or crowded together, therefore being still there can be no wind, and the longer it holds the greater the calm, if it continues two or three days, a Feather will fall perpendicular from a considerable height, so that let the weight be what it will, or can, when ever it stands it is always calm, which may be further said to be almost more than true (if possible) for it may continue to increase or decrease one, two, or three parts in 24 hours, and yet it will continue calm from the highest to the lowest variation.

And so for violent Storms, Tempests, Hurricanes and Tornados, they being produced by such means related in the third Chapter, it will be impossible any of them should happen, when the weight of the Air does not alter above two, three, four, five, or six parts in twenty four hours, nor indeed in half



that time, let the alteration be in what part of the variation it will, tho between 2020 and 1980, five or six parts will be near as much as ten in any other part : for if it be more than 2020, the Air is too dry or fair, so there is nothing to put it into motion, and if it be less than 1980, it is too wet, or too much filled, and thickned every where with the Effluvious vapours to receive any such disturbances ; and the reasons why none of these violent tempests never come when the weight of the Air alters no faster, are that the Effluvious Vapours come smoothly on, and the Atmosphere thickens by degrees, and by that means our Hemispherical part thereof is gradually filled to a greater or lesser depth and thickness, and therefore must be leisurely discharged in the manner related in the second Chapter about Rain, for thus our Hemisphere is secured from all manner of violence, from outward attacks, or inward disturbances of strong Compressions, confused Eddies, and heaping Superonerations ; yet when any of these violent Tempests do come a calm must preceed, and our Hemispherical



spherical part of the Atmosphere must continue very still for some time before ( for if the Air be in motion, tho in never so gentle a course, there can no such thing happen, because it will be carried off by that current as it comes ) that their productions may be the better collected and kept together; than in such places as are subject to these violences, they may be reasonably expected from some Cavernous Vulcanos, Calid Emotions, strong Effervescencies, Subterraneous or Submarine Eruptions, either single or complicate, from one or more places, the Emanations being powerfully sent up perpendicularly from the Horizon or inclining (as the disposition of the Air is) for a considerable time, in such a calm season, (like smoak from Chimneys) they propel the Air before them, and so make room for the other Effluvia that follows with the same swiftness, and the rest of the Atmosphere to unbend, if it inclines with its whole Elasticity, that makes as quick a current, till the propelled Air being strengthened by a mighty *Turba*, can be driven no further, and the other following



lowing with as great strength, they become fenced on every side, with such mighty pressures, that they fill the whole lower Region, and thereby in a manner keep off the whole body of superior Air from any gravitation, till at last it is discharged in so dreadful a manner, with such amazing discharges. And thus these Tempests by a small inclination at their first risings may be carried a considerable distance from their local originals, and their skirts may chance to make so great an alteration in the weight of the Air, that they may be expected there, if not carefully observed, and so in lesser Storms, and also in showery Seasons of temperate Countries, the weight of the Air will sometimes alter in this manner, when no Rain can come within eight or ten miles of the place, but if these Tempests in their perpendicular ascensions are equally dilated on every side, they are in a little time discharged very near the place of their first productions, with more or less violence, according to the plenty of the Matter and disposition of the neighbouring Air.

Thus

Thus all these Tempests are easily foretold, for if in two, three, or four hours time the weight of the Air decreases 20, 30, 40, or 50 parts, we may be certain some of these sorts of weather will follow, tho sometimes the Winds will blow when the weight of the Air increases 10, 15 or 20 parts in six, eight or ten hours, but then it must decrease leisurely before, and a little rain before it rise. The several sorts of Tempests may be distinguished by the particular parts of the variation the decrease is made from, with respect to the Country and Season, yet if it begins about 2015. and decreases to 1980 or less, it will Thunder tho in Winter; if it begins about 2010, and rest about 1970, it will be only Winds with very little Rain, but such Winds as very seldom happen. We had an example on the sixth of *February* 1699, at 10 over night before, a Cylinder of Air weighed 2011, the same morning at 7 it weighed 1991, at 10 in the forenoon it weighed but 1965, which was 36 parts in three hours time, and 20 the night before, which were 56 in all, in twelve hours



hours time. It rested at 1965, till about nine the next morning, at two afternoon it weighed 1970, and at night it weighed 2011 again, at 7 the next morning, which was the eighth, it weighed 2022. How strong and tempestuous a wind we had at that time, not ( I suppose ) be related, few Houses escaping its fury, and many Houses and Barns blown quit down ; and many thousands of Elms in the Kingdom, and several Oakes, one near *Hamsted* 5 miles from *London*, twisted like a Withe, of great Bigness.

## C H A P. VI.

*What Frost and Thunder is ? A conjecture  
at their Causes and Production.*

**W**HAT I have to say upon these two difficult Subjects, is chiefly from Experiments and Notions that have reciprocally directed one another in some further and more easie ways of their productions, by the use of this Instrument, yet am not arrived beyond conjectures, but hope they will elucidate these things to a further discovery of the very truth it self. Frost and Thunder then, I believe, are not produced by such means as have been formerly maintained, the first from nitrous Saline particles disperfed in the Air, and was only thought to be the last effect or production of Cold, and the other from Nitro-Sulphureous particles in the same manner disperfed, but then collected, and afterwards by ve-  
G ry



ry hard or difficult means set on fire in the midst of so much Water. But Thunder I suppose may be much easier produced from a collection of the Solar Rays, by a particular disposition of the Effluvious Vapours or Clouds, and Frost by a privation of those and other Calorifick Corpuscles, which create a certain stiffness, from a contrary tendency, and want of motion. But first of Thunder, our Atmospherical Effluvia having no other original than the Terraqueous Globe and its productions, how plentifully soever they are sent from the burning Mountains, Grottos and Vulcanos in *Japan, China, Sumatra, Fez, Fogo, Sicily, the Alps, California, New Spain*, or other places, (some of which are said to cast their Ashes two hundred Miles about) either of Niter, Sulphur, Bitumine or any other simple or compounded combustible matter from any other parts all of the Earth or Sea; they are all too much mixed with the Aqueous Particles that accompany them or the Clouds they compose, to be set on fire in the Air, or to Thunder there, any other ways than with their Echos or Winds they pro-



produce, they may indeed thunder in these Vulcanos under the Earth or Water, shake and tear it in a terrible manner, and produce many fiery eruptions from such places, but can never be re-inkindled in the Air, or any other distant places from their local originals, for if these Effluvia of Niter and Sulphur be distilled or sublimed from these places, with never so great a fire, the first will be liquified with its own Phlegm (after the manner of other distillations) and the other by these, and other humid vapours in the thundering Clouds or Air, and so can never be set on fire after they are raised from their Concrets, for Thunder in the Air, I believe, is never without a Cloud and some Rain, nor can the spirits of Niter, Sulphur, Salt, Vitriol, Aquafortis or Regis, produced by these or any other distillations, being any ways mixed, either with themselves or any other things, be brought to any more than a heating Bullition, and not to an actual fire; and if we should suppose the Atmosphere to consist of two third parts of Niter and Sulphur in substance (when it is impossible there should be one, in



proportion to the other parts of the world ) and to be driven never so close by Winds and Compressions, the other third part will prevent the Ignition of the rest, which is easily experienced by taking Niter, Sulphur, and Water of each alike in a Crucible, that will hold two or three times as much, well luted, and set it on a gentle; fire at first, the Crucible may be very red without any fire breaking out, and if then a vent be made through the Lute, to let it boyl over, which it will immediately do into the fire, yet it will not kindle till the water is evaporated. We have another common Experiment in the tryal of Spirits of Wine, with Gunpowder, the most inflammable of any thing we know, by taking the Spirits of Wine in a Spoon, with some Corns of Gunpowder at the bottom, and setting it on fire, if there be but a little Phlegm in the Spirits, the Gunpowder will be left almost dry at the bottom, yet not fired, tho surrounded with the fire, and kept stirring all the while. Thus it seems almost impossible Thunder and Lightning should be produced from any thing of Niter or Sulphur, or any



any Terrene Effluvia without some other assistance, but rather from a Concave Collection of the *Promethean* Fire, by several Nebulous Conical Profundities, which cannot be when the Air thickens by degrees for continual Rains, for then the Sun Beams are equally mixed with the Effluvia, only some few excluded; and the Atmosphere being of one consistency, there can be no such disturbance but when it is somewhat still, and in a little dryish time and place, when the Effluvia are sent up by more plentiful streams from some particular places, and fewer from others, by which, if those streams receive a circumjacent pressure, by their propulsions through the Effluvi-ous Air, or be but kept from dilating, they will naturally terminate in Cones, but whether Conical or Cylindrical, those nearest the Earth will be most united, and thereby form the Solar Rays into erect or inclining Conical figures amongst the Clouds, which by the Atmospheric Eddies and Currents, that are then very deep, both Fire and Water becomes more and more compressed, and cannot be carried



ried very far before they are discharged, some indirect Coruscations, which they may gain by that motion, and others in collateral or inclining one, which they may be brought to in the same manner, so that whenever the Effluvious Vapours receive or acquire, such a disposition, with sufficient depth and density, it may Thunder tho in Winter; and for further confirmation, if we take an ordinary Concave-Glass, and concentrate the Sun Beams, but upon a Bason of Water, they will quickly put it into a Bullition, and if kept steady upon the same place for some time, they will at last give it the same motion and sound of Thunder, with that in the Clouds; but if with a conveniently shap'd and sized Glass, like a Bault-head, with a long neck, being exactly placed and filled with fair water, and with a good Concave-glass, the Sun Beams be concentrated upon that solid body of Water in the other Glass, with care to heat it leisurely, that the fire may not crack the Glass, till thoroughly warm, and then kept steady upon the same place as before, these Igneous Corpuscles



cles will not only bring that water to the same Thundring Bullitions with that in the Clouds by the various impulsive motions of its rising and falling, but these very Beams by those impulsions will variously penetrate both glass and water in diverse lightning flashes. Thus we have no occasion to fill the Air with so much Niter and Sulphur to save the Phænomenon of Thunder and Lightning, but it will be sufficient to have it seasoned like other products, then for the Lightnings coming downwards, either right, side ways, or inclining, and as it was thought contrary to the nature of other fire, whose flame was also thought would go no other ways but upwards, till by melting Niter in some Iron or other Sulphureous Vessels, that spirituous and penetrating Salt by that heat mixing with the imbibed Oyl or concentrated Sulphur, as soon as it has acquired a compleat red body of fire (I say a body of fire) whose Atoms having the same passages, can as well go back, as they came in, and these Saline Particles can now (we see) by the help of that Oyl or Sulphur accompany



ny them with natural Coruscations, for Niter being made a body of fire that consists of such subtile or rather spirituous parts, to what part soever the Oyl or Sulphur, or any other combustible matter is contiguous, from thence the flashes must proceed (there being nothing to hinder) as well downwards, inclining or sideways as right up, and so from any other body of fire, that is not fuel, as well as Niter, for Niter is no ways inflammable of its self, which may soon be proved in a Crucible at any time, but it is impossible the flame of any combustible matter alone, however disposed should go any other ways than upwards (except the Air incline it other ways, because the Terrene Propulsions are made that ways, and increased by the heat if near, and most such things growing liquid, by inversion, and that weight are extinguished, but yet it is as unlikely if not impossible that any fiery flashes should be produced from any Terrene Concrete to be continued to half that strength and distance that Lightning is known to be of, nor can they by any means be brought to a true



true resemblance, not those of Niter and Sulphur, to them of Lightning, whose Rays being universally diffused, are easily collected, and may be compressed a thousand times more than a little Air in a wind Gun, to solve the Phænomena of many other Consequences; but the hardest of all is, that it is often times known to Hail with Thunder and Lightning, how these Clouds that contain so much fire, should yet freeze the water is very strange, that it cannot in thundring weather well be thought to freeze in falling, as was formerly asserted; but rather that in warm seasons, as some places become dry, so the moist ones send up more plentiful Effluvia, whereby these plentiful Effluvia become limited to such places, and more Jeune Effluvia to the dry ones, which being augmented to a sufficient depth and density, they will both exclude, and collect the Solar Rays at the same time, the more powerfully by this disposition, and their contrary qualities; and so may Hail and Thunder at the same time, tho in hot weather, this also is the reason why commonly the

H                      Spring



Spring time (and not in Summer) is more windy and stormy than any other Season, and from hence another of more wet in Autumn, but will be too much for this short account, tho it would further elucidate the matter, and give an explication to that of Frost, which I shall now endeavour to evince by these Experiments.

Frost then being only an ultimate (but may be not the most ultimate) effect of Cold, is produced by greater or lesser degrees of that, and that not by any subject of Inhæſion, but by a privation of heat, Paucity of Calorifick Corpuscles, and want of motion, or lesser agitation, and contrary tendency: Frost therefore being only an effect, or product of Cold, is either more or less intense, according to the degrees of its Cause, and cold more or less freezing according to the privation of heat, and Paucity of Calorifick Corpuscles. What this heat is, and from whence these Corpuscles come, must therefore be considered; the heat is of two sorts, either Terrene, or from the Heavens; the first from several Vulcanos, internal Bullitions, and fermenting



ing Emotions, all which are subject to intermissions, and obstructions, because they proceed from no universal matter, or cause, and several subsidences may both obstruct, and extinguish them; the other from the Heavens cannot be thus extinguished, but may be several ways hindered or obstructed by Hills or Mountains, and several dispositions of the Effluvious Vapours, or may be carried off some other way by the winds or particular currents of Air, or by the Central motion of the Sun to parts of less heat, or not extended far enough for the Latitude of the place, these obstructions or privations of heat makes a Chasm between these and those incorporated in the parts of all natural Bodies, the incorporated particles (as all heat and fire do) soon fade and die, which for want of that continuance, as soon leave all the external parts, especially less active, more extended and therefore more stiff, more porose, and more bulky, which are the common qualifications of Frost, and from these all the other may be easily deduced.



## C H A P. VII.

*That there never is no settled Frost to hold, when the Air continues to weigh 2020 or more, nor never no Thunder when it weighs but 1980, or less.*

**H**AVING now given some account what Frost and Thunder is, tho my Experiments have not enabled me to observe all the circumstances relating to the Title of this Chapter, we having had no great Frosts or Thunders since I have been Master of it, yet by reason of many other Meteorological Concurrences in the alterations of the weather, which I have often experienced, that are in some sort like a Magnetick Clinatory, being plainly applied, shew only South and North, yet by these we are also shewn East and West, and all the other points without removing it to them Plains, so I hope by the Experiments I have made

made in other alterations, and some few I have made in these, to tell the truth of both without staying any longer for these sorts of weather besides being but the reverse of the former Chapter, as to the effects upon the Barometer, it will the more easily appear.

*First*, Then there can be no Frost to hold, when the Air continues to weigh 2020 or more, yet no settled fair weather (except Frost) if it weighs 10 or 15 parts less, and yet I believe there have been no lasting Frosts yet known, but in fair weather, how Frost then which is only an effect of the privation of heat should continue when there is nothing that appears to hinder the Sun Beams, and that there should be no such frosty weather when the Atmosphere continues to be crowded with the thickest clouds of Rain, Hail, Snow, Mists, or other Vapours, which seems wholly to obstruct, them is somewhat strange, till we consider that all these effluvia, whether of Rain, Hail, or snow, &c. are the products of some subterranean Bullitions, or other fermentations



mentations, or of the Sun's reverberations, but let it be from which of them it will, the same effects will follow, for that Heat or Motion that raises them, or the Calorifick Corpuscles conjoyned, do we see keep them all fluid beneath, therefore we may be sure there must much more heat contained amongst those particles that are near a thousand times more dense than those of Air, to maintain their fluidity, and keep them from freezing, thus it is almost impossible we should have any Frost on Earth, when we have such a fuming Sea about us (yet we oftentimes feel it more Cold in such sorts of weather than in clear and frosty Seasons, because our corporeal Emanations can easier keep of a lighter than a heavier Medium or Pressure, therefore our Sensories can make no true distinctions of the degrees of Cold) but as soon as ever the Rain or Snow is over, it will immediately Freeze, but can never hold when the Atmosphere is thus filled, for the former reasons, but when the Air weighs 2005, 10, 12 or 15, if the Latitude of the place, disposition of the Country, and Season



Season of the Year be proper, it will certainly freeze, yet not at the extremities of the Sun Beams, or Earths surface first, for those Igneous Atoms incorporated there, by their own presence, and some few emotions will prevent that, and make the first beginnings so far in the Air, as those emotions reach from the earth, which gradually as these emotions, cease and dye for want of renovations, is extended more and more down, till the outward surface of the earth it self is thus deprived and frozen, many of which frozen particles being constantly emitted, do as well fill the Atmosphere as other Vapours, so that the Air can never weigh 2020 if the frost continues, but less and less by the frosty emissions filling the Atmosphere, for if it weighs 2020, the Sun Beams will come unobstructed upon us, and give no place to any such thing, which they can never do near the Poles, or in other cold Countries, these are the Reasons that the Quicksilver in the Common Barometers in some places is quit lost below the Register Plate, and in others far above it, which the Portable one discovers before hand. Then



Then for Thunder, if it be produced by the ways related in the former Chapter, we may be almost sure when the Air weighs but 1980, the Atmosphere will be too much filled with the Effluvious Vapours, and much more disposed for continual Rains (which will too much wet the Fulminous Particles) then for Thunder or Storms, except *Jupiter* should send a Messenger amongst them, for tho Thunder (I suppose) is not known to be without Rain, yet it is not known neither I believe in continual Rains, besides in Summer Seasons and warm weather, the Air does for the most part weigh the more, and not often times less, not long together, for if it should I am sure the weather would be very unnatural, as well as unseasonable to the Summers products, and might rather be called Winter than Summer; but when it weighs 2014, 2020, 25, 30, or 40, and the weight decreases 15, 20, 25 or 30 parts in 12 or 24 hours, it will be sure to Thunder more or less according to the parts of variation it has decreased, and the time it was made in,  
for



for then the Sun Beams being more radiant are more powerful, and by their dispositions in the former Chapter are more easily collected, and thereby greater Thunders and Lightnings produced; so that whenever the weight of the Air alters, tho never so much, if it did not weigh above 1980 before the alteration began, we may be sure there will be no Thunder, but only tempestuous Winds, and Rains, neither here nor in no other parts of the world, for in cold Countries it does not often weigh a great deal more, nor in hot ones not often a great deal less, which is easily proved without going into them places, with several years continuance to make the experiments, and will without doubt be of further use in many other respects, if improved and applied as it may be to several other natural discoveries; and by abstractions, in time, to the very Center of Beings, the Almighty, Grand and Catholick Efficient, that is in and through all things.



## C H A P. VIII.

*That tho a Cylinder of Air weighs much less in wet or windy weather, than it does in dry weather, yet in a settled frost, tho the Air appears never so clear and dry, it weighs much lighter than at any other time.*

**T**His seeming Paradox, and may be that about weighing the winds would both of them been much more strange, as well as hard and difficult to clear without this Instrument, which is so easie to carry wherever we go, and as easie at all times and places to weigh the Air with, That if the Honourable Esquire Boyle had been so happy, he might have known the reason why the Air was so thick in *Nova Zembla*, that the *Hollanders* Clock would not go without the charge he was willing to give to know the weight of his *Æolipile* full of that Air in the midst of Winter, in his *Physico-motion*:  
*Exper.*

*Exper. pag. 148.* And in his *Hist. of Cold pag. 91.* he has many suggestions about the same Clock, and Captain James's Clock, and Watch that wintered at *Charleton*, and at last says they are but conjectures) for by this it is easier to make a hundred Experiments in weighing the Air, than one either with an *Æolipile*, or the Air Pump, and thus in time to discover a great many more particulars, hard and unthought of qualifications that may be would never have been known other ways, for if according to the Rules, or Laws of Hydrostaticks and Philosophy, several qualifications of Liquids are discovered by their Gravity, this that both weighs and measures at the same time must needs discover many more in all natural bodies, as well as this of Air, and has already discovered some much more subtile than the common Air, and will easily go where that cannot, and may be produced in one weeks time, what this discovery may lead to I know not, but am sure that which discovered it is capable of many others.



That the Air weighs less in wet or windy weather, than in dry weather our Experiments proves, and have told the reasons in the Second and Fifth Chapters, but how it should weigh less in hard frosty weather, which seems to be more dry, is yet to be inquired into, for that cannot be from a greater plenty of the Effluvious Vapours, because by this they are now all imprisoned ( in a manner ) within the Earths surface, nor from an extraordinary agitation of the Air with violent Winds, because there is nothing to put it into such a motion when the Air is so clear. But because those almost inconceivable minute Igneous Particles that are so easie collected in a Concave Glass, and may be constitute the whole *Æther*, and disperse themselves throughout all the Terraqueous Effluvia are by several causes or obstructions mostly hindered, the other growing Languid fade and die in the same manner as the Atoms of our common Culinary Fires do, and want a continual supply like them, with other succedaneums to maintain those curious agitations of the Atmosphere, that keep



keep it from Congelation, these being wanting the Effluvious Vapours become more and more stiff, unactive, cold, or frigid, and at last to a perfect Gelicidation, this continuing makes the whole Hemispherical part of the Atmosphere like one Gelicidium, that with longer time grows thicker and harder, reaching higher and higher, and so more and more keeps off the Airs Gravitation which it can hardly penetrate, because Ice is much more impenetrable than the greatest winds or Clouds of Rain, Hail, Snow, or other Vapours, whereby a Cylinder of Air must weigh much less in a long and settled Frost than at any other time, and yet the Air for the most part much more clear there in the hottest or driest seasons, (for they sometimes want a good rain to clear it) it being easier to see through the straight particles of Ice, than the curvid ones of mists and other Vapours, and thus places at a further distance may be much more easily seen, and the Stars more numerous, and yet the refraction very much greater by this Glaciation, all which Captain *James* relates in his Journal



nal to the Islands of *Charleton*, that on the thirtieth and thirty first of *January*, he saw two third parts more Stars than ever he had seen before, *pag.* 62, and the Cloud in *Cancer* full of small Stars, and the Sun to rise twenty minutes before it should, and set so much later, by reason of this Glaciating refraction *pag.* 64. and yet not more North than we in *England*, in the Latitude of  $52^{\circ}$ , or little more, *pag.* 46. But the *Hollanders* at *Nova Zembla* saw the Sun 14 days sooner than he should have appeared, by this mighty refraction; this made the Air so clear, yet so thick (or rather stiff) as *Esquire Boyle* calls it, that the *Hollanders* Clock would not go at *Nova Zembla*, nor *Captain James* Clock nor Watch at the Island of *Charleton*, thus these Herculian Contradictions are reconciled, and the usefulness of this Instrument further manifested, tho never at the Island of *Charlton*, *Nova Zembla*, or *Green-Land* to weigh the Air in those places, where an *Æoli-pile* of Air in the midst of Winter hardly weighs more than this of ours in clear weather, and the midst of Sum-



Summer, for I dare undertaken to guess the exact weight of an *Æolipile* of Air with this Barometer in any sort of Weather, Place or Time, tho according to the Experiments in the Second Chapter an *Æolipile* of Air sometimes weighs less when a Cylinder of Air weighs heaviest, and sometimes otherways. I say sometimes, for if it were always, that would as well foretell the alterations of weather as the Barometer, and thus also, besides it is easie to prove that Igneous Atoms as well as other Particles have their proper mediums of Retention as well as Incorporation, and our Atmospheric Air being so thin a fluid, it can hold them but a little while, tho never so much incorporated, they having so great a liberty do as swiftly pursue it, and as quickly arrive at the limits of their Extensions and Extinctions, therefore it cannot retain them, except it would also prevent their Extensions, but if the Atmosphere be constantly filled with a great plenty of Effluvious Vapours, tho the *Promethean* Fire be wanting, that which remains and Reverberates with the

Ter-



Terraqueous Emotions constantly assisting (and being in a thicker medium, tho there be a less degree of heat in appearance, yet it will be longer retained) will keep it from freezing, all which is further demonstrable from all other liquids, if heated the thicker they are the longer they keep hot, or whether actually heated or not, a common Thermometer will discover River or Pond-water in Winter time, ( and sometimes in a warmer Season ) to be hotter than the Air ; and Sea or Salt-water to be warmer than those, and Oyl of Tartar or Vitriol hotter than the Salt-water ; and Quicksilver the heaviest liquid we know, which all the world look upon to be very cold, to be warmer than any of them, and so many others likewise.

## C H A P. IX.

*Whether the planetary Beams or influences  
can cause an alteration of weather, to  
be foretold by them.*

**W**Hat some Astrologers have told us about the alterations of the weather from the Planets, is no ways satisfactory, and very strange it should be continued down to these times, that some of our Vertuosi have not told us something about that as well as other natural discoveries, that we might be no longer imposed upon, by telling us the several sorts of winds and weather, &c. are appropriated to the several Planets, but have told us neither Reason nor Cause of this Appropriation, and others that the several Planets are Authors of these sorts of winds and weather : and another that has writ only of the Weather tells us the Seven visible Planets in the Skies have their Correspondent ones, in the Air, and in the Bowels of the Earth,  
K that



that are night and day at work in making those sorts of weather for us, and thereby undertakes to tell the cause of all the vulgar Prognosticators errors, and the true way of judging the weather, with as much truth as the rest: For indeed it is impossible that either Winds, Rain, or fair weather, Frost, Snow, or Thunder should proceed from the Planets, they being composed of no such matters, nor are they intelligent to effect it, yet it must be acknowledged that the Sun and Moon, and the rest of the Planets, and other Stars have their particular Rays of Light (but whether these Rays of Light are Beams of fire or not, and differ only in quantity, and not in quality, as their different lights appear, and from whence they have their lights, whether innate or not, will be too much for this short account) and that those from the Sun (especially) at any time of the year (but too apparent to be questioned in Summer time) are of sufficient power to disperse several Vapours, Mists and Clouds raised from our Terraqueous Globe, for 'tis the Earth, and not the Sun



Sun, Moon, or Stars that is the first Mother of Meteors, 'tis the Terrene Emotions with some new modifications that gives birth to them all, according to the first, second, and third Chapters, and not the Planets conjoyned in watery Signs, where may be they placed the watery Windows of Heaven, spoken of in the seventh of *Genesis*, that makes their *Apertio Portarum*, or opening the Gates of Heaven, and those that rained Fire and Brimstone on *Sodom* in fiery Signs, and others in Airy ones, but we never heard what from earthly signs, therefore as none of these sorts of weather can proceed from the Planets, so neither can they from any of the Signs, nor the Planets conjoyned in them, but the Effluvia being raised in the preceeding manner are indetermined Precisely, both to time and place, yet by several Eruptions, Propulsions, Rarefactions, Compressions, and Resolutions they may receive, or meet with as well in their first ascensions as afterwards, they may be driven, spread and discharged to and in several distant places, without any other assistance, but these chiefly happen in the



To rrid Zone, or in some Hilly or Mountainous Countries, or near some Vulcanos, &c. by Paroxysms, and not often in more open and plain Countries or Temperate Climates, and are constant no where, whereby the Effluvia are sometimes in the first sort of places left, and at most times in other places, to the disposal of the Beams or Influences of the Heavens, which I believe may be evinced, of sufficient power to alter and disperse them : First of the Sun Beams, which in most Countries are known every day they appear, but a few hours to disperse all foggy Mists and Vapours, and turn a dark Cloudy morning into a clear and fair Day, not by any occult property, but by a manifest one, as all other heat in Boýling, Distilling, or other Coction does : and so for winds, the general or Trade Winds, are always according to the Course of the Sun or Earth, as far as these Beams and the inferiour Tract is conformable or proper, some degrees beyond the whole breadth of the Zodiack on either side, they constantly propelling all humid Vapours and Air before them, and



and so likewise the Monsoons, which Sir *Thomas Herbert* in his Travels, says, begin exactly at the Sun's entrance into a Sign of the Zodiack, and blow half a year constantly that way, till the Sun enter into the opposite Degree, and then they blow in the same manner the other way. Captain *Swanly* says, the Monsoons raings five months on one side of the Compass, and five months on the other, and that there are two months in which they change, are variable (or break up, as some term these alterations) in *March* and *September*, when the Sun crosses the Line, and as long as the Sun is on the north side of the *Æquator*, to the Tropique of Cancer, the winds are to the northward, and veery more northerly according to the course of the months, and when on the South side of the *Æquinoctial*, the winds blow from thence in the same manner, and thus also there is half a year of fair Monsoons, and half a year of Rainy and fowl Monsoons, and that the fair Monsoons blow off the Shoars, and the Rainy Monsoons on the Shoars, and that near all Lands, between the  
Tro-



Tropicks, Eastwards of *Cape-Bon-Esperance* in the rainy Monsoons there happen some fair intervals, but in the dry Monsoons seldom any rain, and to this purpose many other relations might be as easily transcribed, but that the certain knowledge and experience of all our own, and other Country Seamen to those places make it needless, thus we see the Beams in those neighbouring Regions are so plentiful and turgid, that they drive all before them in winds, with constant dry weather, if of the Land side, and with almost continual rains, if from the Sea, thus also these tumultuous and unequal crowds of Effluvia make that inequality of heat and cold that *Aristotle* relates, and complains of in the burning Zone, where he had the Sun for Zenith and expected to be scorched with heat, he was forced to go into the Sun-shine for warmth, and that he saw Snow, Hail and frozen water on the tops of Mountains, and the cold so bitter that all the Grass was withered, and Men and Beasts benumbed that passed that way, *pag.* 101 and 109: and this North and South, wind  
heat



heat and cold, wet and dry weather proceeded from the Sun's local position, on the North or South side of their Zenith, or Equator, as his Rays decline from their perpendicularity, and not from fiery, airy, watery, or earthly Signs, for the Sun beams are not earthly in us, nor watery in  $\infty$ , but fiery in  $\odot$ , and always so powerful in the Torid Zone, that they are the chief efficient of all these sorts of weather, without any assistance from the other Planets, there being hardly any room for any of their beams to crowd in.

Secondly, of the beams of the Moon, these being from a lesser light have not so many manifest operations as those of the Sun, yet are known in several places of *India*, and the Torid Zone to cause contractures in the Bodies of those that are too long exposed to them, as well to the Natives as Strangers, tho more to the latter, and that several are made Lame, or else have had some of their Limbs contracted for several weeks, and some for as many months, and others to their lives end, if they happen to sleep where the Moon shines upon them, which several of our Seamen



men who go to those places have also seen, and a friend of mine, a Relation and Merchant that Traded and Lived sometime in the Island of *Sunda* at *Achem* in *Sumatra*, and *Bantum* in *Java* and had traveled many other parts of *India*, assured me he had seen several that had their Limbs contracted, and their Mouths or Necks so drawn aside and twisted by the beams of the Moon, that they were very surprising to behold, and that he himself when he came first into those parts, before he was acquainted with it, took up his Lodging after an extream hot day (according to the custom of the place) in the open air, with slender covering, where the Moons beams could fully come for good part of the night which being past before he waked, when he went to rise, he found the left side of his neck, and up to his Ear, and the same Arm and Soulder (which was very much exposed) so stiff that he was scarce able to stir himself, and was forced to keep within eight or ten days to be cured, which was done by the constant use of inward and outward Aromaticks of the Coun-

Country for that time, and that the Country people told him the next morning, if he had acquainted them with his design, or had passed the night where they did, he would have prevented that mischief by lodging in a place unexposed to the Moons Beams.

The reasons of these disasters must be that the beams of the Moon like those of the Sun, do propel the Terrene Effluvia before them, but having no such heat as they have, these Effluvia thus driven, enter the Pores of the Body in the exposed parts with a contrary tendency, and much less agitated than the Animal Spirits and Humours, and thereby cool and obstruct their natural motions, and circulations, these Nutricious Spirits and Juices being thus hindered, a paucid Lympha supplies (which has no such motion) and thereby Tumefies, Contracts and hinders the proper motion of the part it possesses, which the heat of the body soon exsiccates (may be as it comes), and so confirms it: and as these people say, it is only the beams of the Moon, so neither can we suppose



pose it should be any thing else, for it should proceed from the Wind or cold Damps, then it might be as well when the Moon did not shine upon them, or in some other parts than those on which it did shine, which is not known, and when they do take up their lodging in the open air we cannot suppose neither that the Wind should be concentred upon them through any crack or hole : besides being in the open air, the continual Streams or Effluvia of their own bodies both warm and keep off the neighbouring air from every part, equal to the power and strength of their motions, and so secures them in all places that are but moderately calm and still. Then for the Beams of the other Planets and Stars, there is none can say they are refracted, either by the Æther, Air, or Atmosphere, but that they pass directly down upon us, and so penetrate every part of all these in their descensions, as we see and know their light is sent down thus far; these beams therefore having so great a power, ( notwithstanding the constant Diurnal Circumgyration of the Earth or Heavens ) to continue their direct

direct courses hither, must needs move, alter and impell the Effluvious Air before them ( but yet no other ways than according to their direct positions ) and so may either bring or carry from us misty, rainy or snowy Vapours, or otherways may put the Air into a direct or contrary motion, and so produce Winds, Storms, Tempests, Thunders, Hurricanes, &c. which may thus be foretold at any time, and from what quarter the Wind will blow, with as much certainty as their Motions, and Positions are known, and by this means there will be ( or rather is ) a new account of their Aspects, according to the Lines and Angles they make at the earth, and not amongst themselves, nor from fiery, airy, watery, or earthly signs, for neither of these can have any respect to us, of which this Barometer has given a Diagram, that by taking the Planets places from an Ephemeris to their true places in that, all the alterations of weather, and winds from their Quarters may be foretold at any time.



And further tho not so proper here, these beams that are able to penetrate, move and alter the air, which we can no ways subsist, nor live one hour without, are as capable to penetrate our bodies as that (which we know the beams of the Sun does, &c.) and move and alter our spirits, and so the spirits of all other bodies which cannot be less subject to these motions and alterations than ours are, and if our spirits and the spirits of all other bodies may be moved and altered by these beams, then these spirits being the immediate causes, and only principles of Life, Power, Vertue, Force and Strength, it will be impossible they should be altered and changed, and no alterations made in the bodies themselves; therefore a less limit of the power of these beams cannot be set, than what must at length terminate as well in the bodies themselves. All which I hope to demonstrate further by infallible proofs, if life and leisure serve, in a Treatise by it self, what these Beams and Motions are, that they have power to cause all the alterations of winds and weather we are

ac-

acquainted with, and all other common alterations in our and other Animal Bodies and Spirits, by the Lines and Angles they make at the Earth, and not by their beholding one another, by Sextile, Quartile, Trine or Opposition, which may serve till then, for tho it be the first, yet I believe the most that ever was published before in this way, and question not but future Observations will confirm (not the Names and Motions, but) the Laws of the Stars thereby, for from hence there is a reason why the Planets, Poles of Positions, and the Divisions of the Heavens are taken according to the Latitude of the Place, in an Oblique Sphere, and many other things as pertinent, but referred till then.

## CHAP.



## C H A P. X.

*That it is impossible by any Hygroscope, Thermometer or other Invention to know the true state of the Air.*

**H**AVING now given a short account of the preceding Heads, it will be convenient to say something of the common Instruments that are used to foretell the alterations of weather by ; or that the alterations of the Air are used to have an influence upon ; and such are of three sorts. First such as imbibe the Effluvious Air, and are Callid Hygrosopes. Secondly, such as have a parcel of Air included with ting'd Spirits and sealed up in Cylindrical Glasses, and are Callid Thermometers : or thirdly, such as contain some spirituous or other liquid in a Cylindrical pipe of Glafs, clos'd at one end, and open at the other, and inverted into an open Vial or Cistern of the same liquor

liquor, exposed to the open Air, and are Callid Thermoscopes or Baroscopes, &c.

The Hygrosopes are of several sorts, but the most Fam'd one is that of a wild Oat-beard, described in Mr *Hookes* *Mirtographia*, page 147, others are made of Sheeps Gutts or Fiddle-strings, Pieces of Leather, Ropes, Cords, Sponge, Wool, Paper or Deal-shavings, &c. and may be made of any other thing that will imbi be the humid Air, or that the Air can easily penetrate, as Willow, Sallow, Ozier, Alder, and other soft woods.

That of an Oat-beard turns and unturns in dry and moist weather, and is fitted with an Index that points to all the variations; Sheeps-guts, Fiddle-strings, Pieces of Leather, Ropes and other Cords are fastened against some Wall, Board or Timber, and extended either Horizontally or Perpendicularly, and then a convenient weight hung on the middle or other end will rise and fall in wet and dry weather.

Sponge, Wooll, Paper, or Deal-shavings, &c. are tyed together with some



some string, or in a thin Silk or Linen Case, or Bag, in a round or oval form or balance, with Scales and Weights, which will be heavier or lighter in wet or dry weather.

The imperfections of all which are easily seen, first, in respect of themselves and their adjustings; and secondly, in respect of the alterations of the Air, in respect of themselves, the Oat-beards will in a little time grow much more stiff, hard, close, and brittle, and instead of two, three, or four times turning about will not turn once, and not long before it will not move at all, which it gradually comes to as it grows more and more Ramalious, or fare and Dead, for which reason also there can be no certain adjusting of that, for by the time it can be adjusted at first, the Texture of its parts will be so much altered in relation to its motion, that it will want a new adjuston, and so Sheeps-gutts, Fiddle-strings, Pieces of Leather, Ropes, or other Cords, do all alter in the same manner; nor can Sponge, Wooll, Paper, or Deal-shavings, or any other such thing? be preserved or any ways secured from the same inconvenience?  
but



but if they could, it would yet be impossible they should shew any alteration of weather with any manner of certainty, for as they only imbibe, and are receptacles of the subtile Humid Vapours, that sometimes fill the lower Regions before it rains, so they can shew no other alterations, but what they make in their coming and going, which are sometimes much more in Mists after it has rained, or when there is no rain follows, or upon the going a way of a Frost, or melting of a Snow, than at coming of the greatest rains, and so on the contrary, when these Vapours cannot come so low in frosty or windy weather, they will shew no alteration till after the rain is come, and Snow seldom makes any alterations in them, except it melts as it falls : And in Summer time and dry Seasons, it is so also, no alteration till the rain is coming, or that it have rained, but if a misty morning happen, they will alter much more. Besides, if all these inconveniencies could be prevented, they cannot well be put into a travelling Security, by reason of the several alterations they will be subject

M                      to



to from the heat of the Body, Warmth, and Fires in Houses, and the different tempers of the Air abroad.

Secondly, those that have a parcel of Air included with tinged Spirits, and sealed up in Cylindrical Glasses, these for distinction are called Hermetick Thermometers, and of a later invention, and thereby thought by some to exceed all other discoveries for heat and cold, but are not pretended, nor intended, to shew any thing else, which by the natural Expansion and Contraction of the included Air with heat, and cold, gives way for the rising and falling of the Spirits, and have no manner of tendency for wet and dry, and therefore of very small use or service; for we know the weather is sometimes very cold, yet fair and dry, and sometimes as cold when it rains, snows, or blows, and sometimes fair and dry in hot weather, and sometimes as wet or windy. But as the former are deficient in wet and dry, so are these in heat and cold, and it is impossible they should shew any truth in what they pretend, for no body has yet told us the proportion between  
the



the Head and the Cylinder, nor can they make two to rise and fall alike, with the same Spirits, nor have they told us what is best to put in them, whether Spirits of Wine, Vinegar, Salt, Vitriol, Tartar or Sulphur, or Oyl of Turpentine, Amber, Wax, or Anis, &c. or other things, besides all liquids are expanded, and contracted with Heat and Cold, so apparently, that our Seamen have observed their Ships to draw less Water in Cold and Frozen Countries (tho the Water is not in those places so Salt, therefore not naturally so heavy) than they do in warmer places, so that the Water is thicker and heavier in cold than in warmer places, and seasons: and the Honourable Esquire *Boyle* has observed it to Dilate and Contract it self in the same day, by a Hermetick Glass Bubble, that would sink in Water at noon time, and rise and swim night and morning. Therefore if Water will thus visibly Dilate and Contract it self in such large quantities and places, it will be much more so in the slender stem of a Thermometer, and any sort of volatile spirits, a great many times



more than Salt or other Fountain Water, and thus also some Spirits will Dilate and Contract more than others, which makes all these things the more uncertain, and no body knows how much these spirits will Dilate and Contract themselves by Heat or Cold ; yet there is a way to make a Thermometer free from all these exceptions, which I have performed in another way: then for the other sorts that are called Thermoscopes, &c. that alter both with Heat and Cold, Wet and Dry, by having Air in the top of the Cylinder, and exposed to the pressure of the air at the bottom, these are the greatest confusion that can be, for they shew nothing of truth but by chance, nor can any body tell when they do, or do not, for if it be cold and wet, the cold will contract the air above to make it rise, and the wet will lighten the Atmospheric Cylinder to make it sink, thus it is impossible it should rise and fall at the same time, and so in hot and fair weather, the heat will dilate the air above to make it sink, and in fair weather the Atmosphere presses the

the heaviest at the bottom, to make it rise, and thus whenever they rise or fall no body can tell whether it be for heat or cold, wet or dry weather.

Then for the Quicksilver-Glass, or Common Barometer, there is none that have them but know they will sometimes fall or sink very considerably, yet no rain follow, and at other times rain if it sink never so little, and again sometimes it will be fair, tho it rise, but little, and at other times very wet when it rises considerably : Nor have they given us any certain rules to know when it will rain or be fair, so that all these Instruments are very imperfect and can no ways be trusted to. And thus I have told the Reasons, and next for the Use of that, that will do all these things.

## CHAP.



## C H A P. XI.

*The use of the Portable Barometer, how to weigh the Air, Measure its Height, and foretell all the alterations of weather.*

**H**AVING now given a short account of the reasons for the use of this Barometer, and the insufficiency of all others to foretell any alteration of the weather by, it will now be convenient to shew how to use it, to weigh the Air, Measure its height, and foretell the alterations of the weather by it. First how to use it.

Let the Barometer hang perpendicular in one hand, and by more or less weights with the other bring it to a true Æquilibrium or even Balance, so have you the exact weight of any quantity of Air you desire, and the measure of its height, by the second and fourteenth of the Twelfth of E

*clid*

*clid's Elements of Geometry.* First, by the second of the Twelfth thus ;

Circles are in the same Ratio, as are the Squares of their Diameters, which is thus wrought as the Square of the Standard Diameter is to the Square of the Diameter proposed ; so is the weight of this to the weight of that, and the bigness of the former, to that of the latter.

Then by the fourteenth of the twelfth, that Cylinders and Cones, having the same Base, are in the same Ratio as are their heights, which are thus wrought, as the Base of the Standard Cylinder or Cone, is to the Base of the Cylinder or Cone Proposed, so are the heights of those, to the heights of these, and the Contents of the former to those of the later, thus we have not only the exact weight of any parcel or quantity of Air at any time, but the measure of its Height at all times, and in all places.

And thus also we may weigh any other liquid in its Fountain, and measure its Depth : If we desire only its weight, we need only to put in the Instrument to balance any particular quan-



quantity, so we have the exact weight by measure, but if to measure the Depth as well, it must be balanced at the bottom, whereby we have the Depth by weight, and the weight of what quantity we please. Thus these instruments will be of service for a thousand uses in Weighing, Measuring, Gaging, Surveying the Heights, Depths, Weights, Extentions of all manner of Liquids from one drop or grain of any thing, to a Fountain of Sea or Air, and by that means discover both their Quantities and Qualities.

2. For the alterations of the weather, they are known by the variations of the weight of the Air according to the former Chapters, the Increase and Decrease of which variation I have not yet observed to be more than one in Twenty, Ten in two Hundred, or a Hundred in two Thousand Parts, but will suppose it may alter a hundred and twenty in two Thousand Parts, so that if a Cylinder, Cone, or other Particles of Air weighs now two thousand Grains, Scruples, Drachms, Ounces, Pounds, or Hundreds, it may sometimes weigh two thousand and Sixty,

Sixty, and at other times not above one Thousand Nine Hundred and Forty, (the reason why I make use of this number of weights, I have told in the Second Chapter.) The parts of which variation may be thus call'd

Hard-frost	1940	Hard-frost
Wet	1950	Frost
	1960	Frost
	1970	Snow
Rain	1980	Rain
Changeable	1990	Changeable
Fair	2000	
Set-fair	2010	Stormy
very-dry	2020	Fair
	2040	Set-fair
	2060	very-dry

N

The



The words above the Figures as the Air grows heavier, and those below it as the Air grows lighter, but for the exact knowledge of the weather, to foretell all the alterations in quantity and quality, we must observe the rules in the following Chapter: And thus I have by two plain and easie Geometrical Propositions shewn the manner, and now give the World leave to judge of the Probability, Possibility, and usefulness of this Instrument, in many other things, than can possibly be thought of, or applied to in this Age, and to consider if they please, what it may lead to further in divers other respects, and what additions they may in time be able to make to it, for it is capable of many improvements, and will recompense the Industrious that understand it with several advantages in their own private business, if they bestow but one tenth part of the time, pains, and cost, upon it that I have done.

## C H A P. XII.

*Rules for the more certain knowledge of  
all the alterations of weather, both in  
quantity and quality.*

**F**irst, to have the Barometer alwaies  
with us, that we may alwaies  
know the weight of the Air, and  
how it has been two, three or four  
days before, whether growing lighter  
or heavier, and in what part of the  
variation it is. Then first in Summer  
it may weigh near 2060, and if it  
decrease 3 or 4 parts in 24 hours, it  
may hold till it comes to 2010, before  
it rains, which will be but little.

2dly. If it decrease from about 2060,  
to 2040 in 24 hours or less, it will  
be windy, yet clear and dry, but it  
will hold but a little while, for it  
will soon increase again, but this sel-  
dom happens.

N 2

3dly.



3<sup>dly</sup>. If it weighs 2040, and decreases 16, 18 or 20 parts in 24 hours the wind will blow, and it will rain a little, but it will be only a Storm, and after that it will increase again in an hour or two, and be fair.

4<sup>ly</sup>. If it weighs 2030 and decrease to 2020 in 18 or 24 hours, it will be windy for a day, but if it rain it will be only a small shower or two of a few minutes continuance.

5<sup>ly</sup>. If it weighs about 2030 and decrease 2 or 3 parts in 18 or 24 hours, it may decrease to 1980 or less before it rains, which will then be for a whole day, with a soft driving wind.

6<sup>ly</sup>. If it weighs 2030, and decrease to 2000 in 18 or 24 hours it will Thunder, Lighten, Rain and Blow in a very violent manner, and pour down a Sea of water in a few hours, with terrible Displosions of Wind and Thunder, hardly to be distinguished.

7<sup>ly</sup>. If it weighs about 2030, 2026 or 24 and decrease to 1990, 1985, or 80, in 16 or 18 hours, it will be a most violent Hurricane with most violent Winds, Thunders and Lightning,

ning, as if the whole Heavens were on fire, with as violent rain poured down by whole Seas, for some hours or half a day together.

8<sup>ly</sup>. If it weighs about 2020, and decreases to 1980 in 18 or 24 hours it will Rain, Thunder and Lighten, and be as great a Tempest as we commonly have in these parts, and may hold the biggest part of a day, or night as it begins.

9<sup>ly</sup>. If it weighs but 2010, and decrease to 1980 in 18 or 24 hours, it will Thunder and Lighten and be very Windy and Tempestuous. with large Hail and Rain, to the turning up of several Houses and Trees, tho in *January*.

10<sup>ly</sup>. If it weighs about 2010, and decrease to 1980, 1975 or 70 in 12 or 16 hours it will be Windy to a Miracle with little or no rain, but if it be 24 or 30 hours, in making this decrease it will then be Windy and Rainy with Hail and Thunder.

11. If it weighs about 2000, and decrease to 1980 or near the matter, in 18 or 24 hours it will be stormy with



with Rain and Hail and Winds, but calm intermissions.

12. If it weighs but 1990, and decrease to 1970, 65 or 60 in 18 or 24 hours, it will be very tempestuous with Wind, small Hail, Rain and Thunder, but most Wind, and that Wind like Thunder.

13. If it weighs about 1990, and decrease 2 or 3 parts in 24 hours, if it decrease 'never so long it will rain all the while, but if it stands or increase a little, tho it weighs but 1970 or less it will be fair.

14. If it weighs but 1980, and decrease 2 or 3 parts in 24 hours there will be very cold Rain all the while, and if it weighs but 1970, and so decreasing it will Snow tho at Midsummer and be very cold and very wet, more like Winter than Summer.

15. If it weighs but 1960 as, it cannot weigh much less two days together in Summer, so we may be sure it will be very cold wet and winterly.

16. And from what weight soever it decreases 3 or 4 parts in 12 hours,  
if

if it have stood 2 or 3 days before, it will be windy with fresh and pleasant Gales: And if it increase 5 or 6 parts in 12 hours from any weight, after it have stood as before, it will be a little windy.

There should be 3 or 4 Rules more for the increase, but that being for the most part fair or windy, except between 1980 and 2000, they may be omitted for the present: Thus for the decreasing to the Winter, and tho Winter have brought it to so small a weight, yet it will not hold, except it begins about 2000 or 1995 at least.

17. Therefore if it continues to weigh 2000 or 1995 parts, two or 3 days in Winter, it will freeze, & the longer it holds, of that weight the more, but if it increase 2 or 3 parts in 24 hours, two or three days together it will go away, and if it decrease two or three parts in 24 hours, it will continue and Freeze harder and harder, as long as it so decreases, till at last it may not weigh above 1945 or 1950, and yet it will be very fair and clear, but very sharp  
Frost



Frost as long as it holds of that weight

18. Thus being of the least weight it can be, if it increase from 1945 or 50, to 1960 in 24 hours, it will be windy, but very clear and extreme sharp and freezing; and so also if the weight decrease from 1960 to 1950 or less in 24 hours time, it will be such a freezing wind, but if it increase or decrease but one or two parts in 24 hours between these two, there will be very little alterations, only clear and freezing.

19. If it increase from 1960 to 1970 in 24 hours, it will Snow the next day in Storms, but it will soon be over, and decrease again, but if it increase from 1960, 2 or 3 parts in 24 hours till it weighs 1970, or 1975, it will Snow considerably, and if in Snowing the weight increase, it will Snow the more, but if it decrease it will be the less.

20. If it increase from 1970 to 1980, or 1985 in 24 hours time, it will be very windy, and at last Rain, and then decrease again, and Thaw, but

but if it increase again, the Frost will not remain, as it will notwithstanding the rain if it decrease, and if it increase 2 or parts in 24 hours till it weighs 1980 or 85 the frost will certainly go with plenty of rain.

21. If it increase from 1980 to 1990 it will be fair and freeze again, and if it increase 2 or 3 parts in 24 hours will hold till it weighs 2318 or 2020, but then it will grow warm and misty (first thawing in the Air) and the frost will go away without rain, nay so much without, that it will be fair and clear all the while it is going, tho in the midst of Winter.

22. If it increase from 1999 to 2000 in 12 or 16 hours it will be windy the same day, and then decrease a little and rain the next, but if it increase but a little it will hold fair and be calm.

23. If it increase from 2000 to 2020, 2030, or 40 in 18 or 24 hours it will be windy, but fair, yet rain the next day by storms, and after that a settled warm rain, but if it increases leisurely it will hold fair all the while.



24. If it increase to a bigger weight, it will be more like Summer than Winter, very fair clear and warm, without any frost. The truth of all which is very plain from the former Chapters, and the following Experiments.

In *December* 1696, when I was sure I could weigh and measure any parcel of Air, observing some alterations of weather, that I could not then give any reason for, I bought a common Barometer or Quicksilver-Glass, and then an Hermetick Thermometer, by which I made several other sorts to compare my own, and all their differences with the alterations of the weather in a Diary, which I continued to *June* 1699, on the 12 of *January* 9<sup>th</sup> a frost began (which proved to be the hardest since the great one, 13 years before;) the Air weighed that day 1996 and continued with very little alteration till the 16<sup>th</sup>, after which it decreased 2 or 3 parts, and sometimes 4 in 24 hours, to the end of the month, when it weighed but 1950; the second of *February* it increased a little and weighed 1962; on the fourth when there was so sharp a freezing

ing wind, that my hand on the Iron handle of a Pail or Well-Bucket, it would cleave so fast to it that it was ready to pull off the skin to take my hand off again, or to try with my finger as several others did, by dabbing on a fresh place of the Iron, it immediately stuck so fast it made it very sore to pull off, and could not indure to do it above a time or two. After the fourth it decreased again till the seventh, when it weighed but a little above 1949, where it continued 12 days to the 19<sup>th</sup>, and was very sharp, but after that it began to increase again slowly, till the 6<sup>th</sup> of *March*, when it weighed 1968, and went away a few days after. About the 20<sup>th</sup> of *January* when the weight of the Air was abated about 19 parts, and the Quicksilver sunk between three and four tenths, I began to think the weather would alter in a few days to Rain or Snow, but weighing thus till the end of the month, the Air growing lighter and lighter all the while, and the Quicksilver at last near half way below Rain, and yet the weather clear, and more sharp and



freezing by the Hermetick Thermometer, was I thought the strangest thing that could happen, I therefore weighed and measured several quantities or particles of Air, in Cylinders, Cones, Globes and other figures of several dementions, some times 18 or 20 times in a day in several distant places, Tops of Hills, Vallies, Deep-wells, Mines, and Coal-pits, warm fire Rooms, Stoves, and open Air; And thus at last with a great deal of Pains and Cost found the Air it self was frozen, and thereby kept off the Superiour Gravitation, and by continuing these means, the reasons of all the other alterations of weather as well hot as cold, wet and dry, Wind, and Thunder, &c.

*November the 28th 1697*, a little frost began of about 8 days, that day the Air weighed 1972, the 30th it weighed 1997, the 3d of *December* it weighed 2022, the 5th 2034, being very fair all the while (and froze very hard about the 1d and 2d) the next day it grew warm, but then decreased to 2003 in 24 hours, there was first a little Snow, then small Rain, and the frost went away. But

But *December* the 3<sup>d</sup> 1698 having been frosty for some time, the weight of the Air increased to 2020, the 4<sup>th</sup> was very fair yet thawed apace, the mornings and evenings a little misty with the thaw, but otherways very clear and so went away without any Rain.

The 29<sup>th</sup>. of *October* at night 1697 the Air weighed 2018 the next morning it weighed but 1996, the day was very windy but no Rain.

But the effects of the Greatest wind that have been for many years are related in the 5<sup>th</sup> Chapter.

*April* the 10<sup>th</sup> 1699, the Air weighed but 1978, the 11<sup>th</sup> it weighed 1996, there was first a little small rain, but after that very windy, the 12<sup>th</sup> in the morning at six it weighed 2018, at 10 but 1990, at 12 1988, about 3 or 4 in the afternoon, being near *Maidenhead*, there was a very strange and unusual Tempest in the adjacent parts of *Buckingham*, and *Barkshire*, of Wind and Thunder and Lightning, with Hail, and Rain, with that violence or strangeness, that the Displosive Crackes of Wind and Thunder



der were hardly to be distinguished.

*April the 16th* following, being near *London* at noon the Air weighed 2005, at 9 at night but 1987, the 17th at 6 in the morning it weighed but 1970, about 2 afternoon it began to be a little Stormy, and at 4 a great Tempest of Thunder and Lightning, Hail and Rain. I have many other remarkable alterations of Rain, Snow, Cold, Hot, Wet and Dry weather, but reserve them with the several other things for another opportunity.

---

---

---

# ADDENDA.

**S**INCE the former sheets were in the Press the continual use of this Barometer has discover'd several other things that former Ages were used to think too Good for their Enemies, or Ungratitude, which, may be, was the Reason that have hindred us from those Advantages: Some of these are, First, the true Cause or Reason of the Ebbing and Flowing of the Sea, in so plain and satisfactory a manner, that it leaves no room for the least scruple about it, and Salves all the Appearances (with Mathematical Certainty) of that hitherto unknown mighty work of nature, why the highest and lowest Spring and Nape Tides, are Constantly about three days after the Change, Full and Quarters of the Moon; And why the Spring and  
Nape



### *Addenda:*

Nape Tides are so much greater in March and September than at any other time of the year, And why there is 15 or 16 Foot Difference between high and low Water in some Places, and not above 3 or 4 in others : And though I have neither had neither time nor opportunity to observe it, since I Discover'd it, yet I am sure it is not the Moons being upon a Certain Meridian that makes it high or low Water at that time, the same day, but a Particular and Proper Distance of the Sun and Moon, 24 hours, or more, before that time, All which is as Plain as the Tides are visible.

And immediately after it discovered the true Reason of the Magnetick Needles Pointing to the North and South, and of its variations : And that many other things so Placed will have the same Tendences, as I soon Experienc'd. After which, I tried several others Exactly fitted in as many Fluid Currents, which all stood the same way : For if they were nicely fitted in true *Æquilibrium*, and Both Ends of equal distance from the Cen-



### *Addenda.*

Centre they would not Point but Lie Cross the Current : But if being in Aquilibrium, one End were longer than the other, they would not lie Cross, but Point, and which End that was, may easily be guess'd. From whence we may be sure the Longitude Can never be truly found by the Variation, or the Variation of the Variation, as some have thought.

It has Discover'd several other things about the Prime and original Cause of Winds, Rain, Hail, Frost, Snow, Thunder, and other Meteors : what it is that gives the Air that motion we call Wind originally, and what Gathers Clouds, and Condenses the Effluvia into Rain, That it is not the influence of  $\odot$  or  $\updownarrow$ , nor the Central motion of the Sun, nor always the Latitude of the Place that makes Warm or Cold Weather : But that the Cloudes do always Concenturate the Sun Beams to make Thunder, with a further most Plain and Sensible Demonstration of the Influence of the Stars (that are so sweet and binding, and in their Courses fought against *Sisera*) in all Respects as Appa-  
rent



### *Addenda.*

rent as we see and know the Blowing of the Wind. These if Life and Leisure last, will at some time or other come abroad, either by themselves, or in another Edition of this, to which by their Discovery they do more Properly belong.

In

---

**I**N the mean time, if any Gentlemen, Merchants, Seamen or others, desire any of these Portable Barometers, as They are of real worth in all proceeding ways, and for many other Discoveries, and have been very chargeable, so they will not be parted with but by Subscriptions, for a Thousand to pay one Guinea a piece down, for as many as the Subscriber intends to have, to Mr ——— whom I shall be obliged to give a discharge, and return the Money if they be not Delivered in three months after Subscriptions, but upon delivering the Barometers the Subscriber to pay half a Guinea a piece more, for as many as he has subscribed for. So the



Subscribers shall have them Compleat, as easily Portable in a manner as a Knife and Fork, or some Ink-Horns, and as secure to be carried any where, that neither the heat of the Body, Fire, nor Air, (except put into the Fire) Frost, nor Wet, can any ways alter. Which if secured from other Makers would not be sold under two or three Guineas.

---

The

---

---

T H E

# Table or Contents.

CHAP. **W** *Hat the Portable Barometer is, the Constitution of the Atmosphere, and that the Effluvia keep off the Airs Gravitation, and are the Cause of the variation of its weight.*

Pag. 1

Chap. 2. *How Rain and Snow is Generated and Produced, and why they make a Cylinder of Air lighter, and yet any other particular parcel of Air much heavier.*

Chap. 3. *How Winds, Storms, Tempests, Hurricanes, and Tornados are produced.*

19

Chap. 4. *That violent Tempests, Hurricanes, Tornados seldom happen in cold Countries, Winter Seasons, large Plains or Great Seas.*

28

Chap. 5. *That they are easily foretold, because they produce the greatest variations, in the weight of Air.*

32

Chap. 6. *What frost and Thunder is, a Conjecture at their Causes and Productions.*

39

Chap. 7. *That there never is no settled Frost to hold when the Air continues to weigh 2020 or more,*

nor,



## The Table of Contents:

ner never no Thunder when it weighs but 1980 or  
less. 42

Chap. 8. That tho a Cylinder of Air weighs much  
less in wet or windy weather than it does in dry  
weather, yet in a settled frost tho the Air appears  
never so clear and dry, it weighs much less than  
at any other time. 48

Chap. 9. Whether the Planetary Beams or Influ-  
ences can cause an alteration of the weather to be  
foretold by them. 55

Chap. 10. That it is impossible by an Hygroscope,  
Thermometer, or other Invention to know the true  
state of the Air. 82

Chap. 11. The use of the Portable Barometer, how  
to weigh the Air, Measure its Height, and fore-  
tell all the alterations of weather. 86

Chap. Rules for the more certain knowledge of all  
the alterations of weather both in quantity and  
quality. 91.

FINIS.

---

Books Printed for *W. Hawes*, at the  
*Rose in Ludgate-street.*

**A** True Account of *Germany*, its Strength,  
and Power ; together with a Dis-  
course of War and Peace, with Remarks and  
Maxims of *Charles V.* late Duke of *Lorrain*,  
General of the Emperor's Forces. From a  
Manuscript left by him, and never Printed  
before.

A New *English* Dictionary with the Terms  
of Gypsies, Beggars, Thieves, Cheats, &c. Use-  
full for all sorts of People (especially Foreign-  
ers) to secure their Money, and preserve their  
Lives, beside, very Diverting and Entertain-  
ing, never Printed before. by *Edward Bella-*  
*my* of *Grays-Inn*, Gent.

Ten Pleasant and Delightful Novels.

V I Z.

Rival Ladies.	}	The Perfidious Mistress.
The Mistake.		The Metamorphos'd Lover.
The Generous Lover.		The Imposter out Witted.
The Libertine		The Amorous Miser.
The Virgin Captive.		The Pretended Alchymist.

Being Collected and Printed in 1. Voll.